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## Algorithms: What, How, and Particularly Why?

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2019

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### **citation for published version (APA)**

Lodder, A. R. (2019). *Algorithms: What, How, and Particularly Why?* (LSE Law : Policy Briefing Paper; Vol. 34). SSRN. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3392869](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3392869)

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The top half of the cover features an abstract background with a dense, swirling pattern of small, light-colored numbers (0-9) and symbols (like +, -, x, /) on a dark, textured blue-grey surface. A large, faint, dark silhouette of a human head is visible on the right side, facing left.

# Algorithms: what, how, and particularly why?

Arno R. Lodder

POLICY BRIEFING 34

MAY 2019



# Introduction

In May 2019 the LSE launched its future strategy LSE 2030,<sup>1</sup> with the following opening statement:

*“Our strategy lays out the guiding principles and commitments that will help us shape the world’s future...”*

That is what a good teacher tells their students: that they not only *are* the future, but that they have the capacity and responsibility to shape the future.

In the context of Big Data Ethics this is aptly phrased by Richards & King:<sup>2</sup>

*“We are building a new digital society, and the values we build or fail to build into our new digital structures will define us.”*

Algorithms are an integral part of our digital society. The ever growing availability of data in combination with incredible computing power led to today’s success of algorithms. There is, however, also reason for cautiousness and concern. To mention just a few threats:

- Decisions based on algorithms and profiles without the one who decides being able to provide an adequate explanation. For instance, people do not get a loan because the algorithm decided so based on the data related to the applicant. Or, parents are visited by social workers because the algorithm determined there is a risk of school drop out of their kids;
- The use of biometric data which indelibly connects the individual to their data profiles such as the use of facial recognition software to connect physical appearance to online information;
- Mass surveillance by both government and business.

Given what algorithms can and might do, we as a society in general, and lawyers in particular, have a responsibility to decide how we want to shape the world we live in. What algorithms we do allow and what not, and in case we allow algorithms, under what conditions?

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<sup>1</sup> <http://www.lse.ac.uk/2030>

<sup>2</sup> N.M. Richards & J. King (2014), Big Data Ethics. *Wake Forest Law Review*, <https://ssrn.com/abstract=2384174>

# Algorithms: what, how, and particularly why?

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## What algorithms do

The just-mentioned threats refer to the application of ‘modern’ variants of algorithms, which used to be referred to as software following programmed instructions – or more accurately, as a step-by-step plan to reach given a certain input a certain output. This meaning of algorithm is still correct. However, algorithms are often not coded as such these days; software is now more likely to be designed and trained (sometimes via self-learning) to derive algorithms from analysing sets of data. In the area of law and technology, as well as in many other disciplines, the interest in algorithms now usually refers to the latter type of algorithms. Accordingly, research tends to focus on algorithms that create profiles, support decisions and sometimes even *take* decisions.

Algorithms do many very useful things: they can analyse medical records to identify what might cause a particular disease, or what could be done in terms of prevention; and they can complete more mundane tasks, such as advising what music to listen to next or what series to watch. Algorithms can also decide that you are not entitled to a subsidy, that you are not allowed to a law school, that you are a person of interest to intelligence agencies, or that you are likely to become a criminal.

Some algorithms are first welcomed and later appear to be far from perfect, like predictive policing software or tools advising judges on the chance of recidivism.<sup>3</sup> Some algorithms are clearly awful from the beginning, like the secret system of advanced facial recognition technology to track and control the Uighurs in China,<sup>4</sup> which “keeps records of their comings and goings for

search and review.” China’s network of surveillance cameras is used for this purpose. The algorithm facilitates the identification of the 11 million Uighurs based on ethnic characteristics, e.g. one pointer being that Uighurs more closely resembling people from Central Asia than China’s majority Han population. The system can flag particular situations and send alarms, for instance “If originally one Uighur lives in a neighbourhood, and within 20 days six Uighurs appear, an alarm is sent to law enforcement.”

## Artificial Intelligence

Artificial Intelligence (of which algorithms are a part) is an area in which critical thinking is much needed. Simply put, Artificial intelligence refers to technology that simulates human intelligence, such as learning, reasoning and perception. For a long time AI was confined to theory, but over the last 5 years in particular, due to progress in machine learning, AI is used by all big tech companies and many start-ups. Not to everyone’s ease, for famous people like Stephen Hawking and in a recent survey US citizens appeared worried about the negative impact of AI:

*“People are not convinced that advanced AI will be to the benefit of humanity”<sup>5</sup>*

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3 *The Guardian* 3 February 2019, UK police use of computer programs to predict crime sparks discrimination warning, <https://www.theguardian.com/uk-news/2019/feb/03/police-risk-racial-profiling-by-using-data-to-predict-reoffenders-report-warns>; J. Dressel & H. Farid (2018), The accuracy, fairness, and limits of predicting recidivism, *Science Advances* 17 Jan 2018, Vol. 4, no. 1.

4 *New York Times* 14 April 2019, <https://www.nytimes.com/2019/04/14/technology/china-surveillance-artificial-intelligence-racial-profiling.html>

5 *Vox* 9 January 2019, <https://www.vox.com/future-perfect/2019/1/9/18174081/fbi-govai-ai-safety-american-public-worried-ai-catastrophe>

You can question the knowledge of what AI means and can do,<sup>6</sup> but governments should take such concerns seriously. They can remedy feelings of unease by defining strategies and designing policies about how to deal with the ever-increasing capabilities of Artificial Intelligence.

Many governments are working on policies for AI and algorithms, e.g. US Future of AI Act, The Council of Europe's Algorithms and Human Rights and AI in the UK, ready, willing and able?<sup>7</sup>

Two recent and valuable documents were issued by the European Union in April 2019.

First, *A governance framework for algorithmic accountability and transparency* identified four policy options:<sup>8</sup>

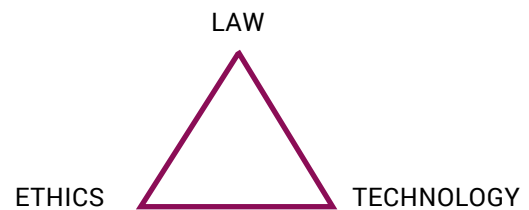
1. Awareness raising;
2. Accountability in public-sector use of algorithmic decision-making;
3. Regulatory oversight and legal liability;
4. Global coordination for algorithmic governance.

Second, *Ethics guidelines for trustworthy AI* distinguished three pillars:

1. lawful - respecting all applicable laws and regulations;
2. ethical - respecting ethical principles and values;
3. robust - both from a technical perspective while taking into account its social environment.

## Law, ethics and technology

The pillars of the EU ethics guidelines largely aligns with a figure I use in my teaching and research to illustrate the issue.



When thinking about norms for technology, this figure helps to balance the various interests and to draw the lines between:

1. The possible (technology);
2. The permissible (law);
3. The desirable (ethics).

Depending on how the three factors are weighed, the outcome can be characterised as either white or black, or any shade of grey. 'White' means it is possible to use technology in a lawful and ethical manner. 'Black' refers to technology that is neither legally nor ethically acceptable. All other variants are grey, even if it is technically impossible and neither the black nor white situation is applicable.

The law provides the necessary legal and ethical constraints to operate within, and ensures governments and companies act responsibly; as a consequence, society at large can have confidence in the technology being introduced and used. It must be noted that in the field of AI, the interest in law and ethics is increasing both in practice and academia. And although one can seriously doubt the sincerity of initiatives like Google's Responsible AI Practices,<sup>9</sup> sometimes called ethical whitewashing, it is still better than paying no attention at all to these issues.

<sup>6</sup> An AI professor made the following interesting analogy. The warnings of Hawking for the dangers of AI would be similar to an AI professor warning for the dangers of black holes.

<sup>7</sup> <https://www.whitehouse.gov/ai/>; <https://rm.coe.int/algorithms-and-human-rights-en-rev/16807956b5>; <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/10014.htm>

<sup>8</sup> [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS\\_STU\(2019\)624262](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2019)624262)

<sup>9</sup> <https://ai.google/education/responsible-ai-practices>

## Does the algorithm have added value?

One preliminary question often forgotten is whether it makes sense to use technology, AI or algorithms in the first place. This relates to the “possible” in the above triangle. The fact that something is possible does not, of course, mean you should use it.<sup>10</sup> This might be because it is ethically or legally wrong, but can also be for practical reasons. For instance, they wanted to use algorithms at Vrije Universiteit Amsterdam for predicting the risk of bad results of students, and based on that plan a consult with the student advisor. Ethical objections existed, e.g. that ethnicity or gender could either directly or indirectly play a role when data sets were analysed. But the reason for the project’s termination was in fact that the predictions did not add value to what student advisors were already doing. This illustrates that often there is a tendency to use algorithms just because the data are available. The first question always to be asked is: are the algorithms (likely) to improve the current state of affairs.

## Ethics guidelines for trustworthy AI

To come back to *Ethics guidelines for trustworthy AI*, as the title suggest the guidelines do not directly deal with the law(ful) question, but:

***“These Guidelines do not intend to substitute any form of current or future policymaking or regulation, nor do they aim to deter the introduction thereof.”***

In their report four ethical principles are distinguished:

1. Respect for human autonomy;
2. Prevention of harm;
3. Fairness;
4. Explicability.

This is a powerful quartet, with general value but not specifically targeted at AI: a human-centric design principle is proposed (1), not adversely affecting human beings (2), equally distributed costs and benefits (3), and explanation is “to the extent possible” required (4). In both legal and technical literature much attention is spend on the last question,<sup>11</sup> which is a challenging one.

One should realize that machine learning and algorithms deal with connecting input data to output. It is about correlation, and not about reasoning. And an explanation obviously should go beyond “given the input and based on the algorithm...”. Explanation needs to justify the outcome, supporting arguments should be provided.

Next to the ethical principles seven key additional requirements are presented, such as human agency and oversight, transparency and accountability. Transparency is linked to explainability, it is externally focused, aims to inform the subjects of algorithms. Accountability is internally focused, aims to provide insight into what one is doing and backing for it. These concepts are both central in the hottest debated legal instrument of the last years, the GDPR.

What is being said in the Ethical framework is all necessary, but not sufficient. Well?

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10 David Post had a similar comment in the context of regulation by code, ‘What Larry Doesn’t Get: A Libertarian Response to Code and Other Laws of Cyberspace’ (2000) 52 *Stanford Law Review* 1439.

11 V. Belle (2017), Logic meets Probability: Towards Explainable AI Systems for Uncertain Worlds, *Proceedings of the Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI-17)*, p. 5116-5120; S. Wachter, B. Mittelstadt & C. Russell (2018), Counterfactual Explanations without Opening the Black Box: Automated Decisions and the GDPR, *Harvard Journal of Law & Technology*, Volume 31, Issue 2.

## Way forward

Cooperation between disciplines is pivotal. For decades we know we should, but too often it is neglected.<sup>12</sup> In November 2017 I presented at a conference in Cyprus *Black box algorithms and legitimacy: getting dark, too dark to see?* Referring to Marvin Gaye I indicated:

*Can lawyers understand “what’s going on”?  
Should we just cherish innovation, “let’s get it on”?*

The first point refers to cooperation, the second to technological determinism, the acceptance of all new technologies no matter what. This is not what governments, companies, lawyers, etc. should do. Critical thinking is required. Only this can prevent the continued following of the imaginary road of always better technical developments, only to one day look back in anger and think: how did we ever get here?

What is missing in most, if not all, assessments of algorithms is the earlier mentioned preliminary question. Assessing new technology means we not only consider what is possible (technology), but also what is permissible (law) and desirable (ethics). In particular, we should ask the “why”-question: what added value does the use of this algorithm has in the first place?

A similar omission applies to data processing, where the question “why should we process data” is mostly overlooked. Even purpose specification is about defining a purpose for the processing of data, not whether the processing serves a purpose in the first place.

*A governance framework for algorithmic accountability and transparency* (p. 73) proposes:

Establishing (and keep updated) a ‘threat matrix’ (...) based on factors such as: impact of its outputs (human rights implications; scale of use; (ir)reversibility of the consequences; etc.); application domain; verify-ability of its behaviour (including failure modes); explainability of decision outcomes; transparency of processing; etc.

This matrix is a very important starting point, which governments should be obligated to use when deciding about the use of algorithms and business advised to. Such a matrix can also be used to identify if and how particular algorithms or algorithms in specific areas of application should be regulated, ranging from:

- Prohibition;
- Severe warranties;
- Little or no precautionary measures.

Next to this type of regulation, what is also needed is a statutory requirement for both governments and businesses to account for their use of particular algorithms and a qualified supervisory body that can check these.

Let us embrace the magnificent opportunities of algorithms, but not be afraid to not (lightly) use them.

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12 A.R. Lodder (2013), Ten Commandments of Internet Law Revisited: Basic Principles for Internet Lawyers. *Information & Communications Technology Law*, Vol. 22, Issue 3, <https://ssrn.com/abstract=2343486> The ninth commandment is about “cooperate with other disciplines ... probably the most self-evident one. (...) In interdisciplinary fields cooperation is crucial, in particular with internet or legal specialists. At the borders there are also other fields that may provide relevant input, e.g. sociologists, psychologists, political scientists, etc. (...)”





## ARNO R. LODDER

Arno R. Lodder is visiting fellow at LSE (March-July 2019, with Andrew Murray), professor of Internet Governance and Regulation at Vrije Universiteit Amsterdam Department Transnational Legal Studies, Centre for Law and Internet), and Of Counsel at SOLV lawyers. In his research and lecturing he focuses on topics related to law and internet, such as liability, contracting, security, privacy, freedom of speech, cybercrime; and phenomena related to algorithms, big data, social media, cyberwar, internet of things, smart devices and apps.

He has published over 30 (co-)edited and (co-)authored books, such as *DiaLaw on Legal Justification and Dialogical Models of Argumentation* (1999), *Information Technology and Lawyers. Advanced Technology in the Legal Domain* (2006), *Enhanced Dispute Resolution Through the Use of Information Technology* (2010), *Cyberlaw in the Netherlands* (2016), and *EU Regulation of E-commerce* (2017). He is involved in the Dutch legal master Internet, IP and ICT (2011-), the English Bachelor Minor Technology, Law, and Ethics (2017-), and the English legal master International Technology Law (2018-).

His internet law group offers about 15 courses in Dutch/English on legal (and ethical) aspects of i.a. blockchain (master course as of 2018/19), robots and artificial intelligence (bachelor course as of 2017/18, master 2018/19), e-commerce, data protection, copyright, and cybercrime. He supervised over 100 master theses, and 7 Ph.D theses.

LONDON | MAY 2019



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